# SCIENCE

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# THE MOBILIZATION OF SCIENCE

IN the Senate of the United States on February 11, Mr. Kilgore introduced the following bill (S. 702), which was read twice and referred to the Committee on Military Affairs:

To mobilize the scientific and technical resources of the Nation, to establish an Office of Scientific and Technical Mobilization, and for other purposes.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

DECLARATION OF POLICY

SECTION 1. The Congress hereby recognizes that the full development and application of the Nation's scientific and technical resources are necessary for the effective prosecution of the war and for peacetime progress and prosperity, and that serious impediments thereto consist in—

the unassembled and uncoordinated state of information concerning existing scientific and technical resources;

the lack of an adequate appraisal, and the unplanned and improvident training, development, and use, of scientific and technical personnel, resources, and facilities in relation to the national need;

the consequent delay and ineffectiveness in meeting the urgent scientific and technical problems of the national defense and essential civilian needs;

the trend toward monopolized control of scientific and technical data and other resources with lack of access thereto in the public interest; and

the absence of an effective Federal organization to promote and coordinate, in the national interest, scientific and technical developments.

The purposes of this Act accordingly are—

(1) to appraise the current use of scientific and technical knowledge, facilities, and personnel, and to develop comprehensive national programs for the maximum use of science and technology in the national interest in periods of peace and war;

(2) to mobilize for the prosecution of the war all scientific and technical facilities and personnel;

(3) to facilitate after the war the transition of the national economy from the tasks of war to peacetime enterprise;

(4) to assemble, coordinate, and develop for use, in the public interest, all scientific and technical data and facilities; to facilitate access to scientific and technical information and literature and to aid and encourage the writing and publication thereof;

(5) to promote the full and speedy introduction of the most advanced and effective techniques—for the benefit of agriculture, manufacturing, distribution, transportation, communication, and other phases of productive activity; for economical and efficient Federal, State and local government; and for the national defense and general welfare;

(6) to aid, encourage, and protect the research and enterprise of inventors, scientists, technicians, scientific and educational institutions, research laboratories and Government establishments engaged in scientific and technical work, and to make their resultant discoveries and data more readily available, and without discrimination, to all sections of industry, agriculture, and the public, in order to aid the war effort at the present time and in order to promote full employment and higher standards of living after the war;

(7) to discover and develop substitutes for strategic and critical materials, and to promote the most beneficial use of agricultural, mineral, and other natural resources;

(8) to promote interest in scientific and technical education, and to provide for all qualified persons the means of scientific and technical training and employment;

(9) to provide guidance in scientific and technical matters to the President, the Congress, and all Federal, State, and local government agencies and establishments, and to contribute guidance and, in all proper cases, financial and other assistance to solution of the technical and scientific problems of industry, agriculture, and of any agency or establishment or individual inventor;

(10) to promote the maintenance and expansion of free enterprise by making available to smaller businesses the benefits of scientific advancement;

(11) to standardize, when in the public interest, scientific and technical designs, practices, and specifications; and

(12) to establish a national scientific and technical office to assure maximum cooperation and integration of the facilities and personnel of governmental and private agencies, institutions, and employers for the above purposes, and to coordinate the activity of these facilities and personnel, where necessary, in the national interest. This Act may be cited as the "Science Mobilization Act."

DEFINITIONS

SEC. 2. As used in this Act—

(a) "Scientific and technical facilities" shall include real property and personal property, tangible and intangible, used or intended to be used for scientific or technical purposes, programs, research, projects, and developments and shall include further all methods, processes, procedures, techniques, designs, specifications, patents, inventions, and scientific or technical information or knowledge of every description used or intended to be used for scientific or technical purposes in research and development or in the production or supply of war or civilian goods or services.

(b) "Scientific and technical personnel" shall include all persons, excepting physicians and dentists, who have completed any course of study in any college or university in any branch of science or its practical application or who have had not less than an aggregate of six months' training or employment in any scientific or technical vocation.

(c) "Agency or establishment" shall mean any agency, board, department, office, bureau, or other body of the Federal or any State or local government, or any person, firm, or partnership engaged in business for profit, and any corporation, profit or nonprofit, association, school, college, and university.

ESTABLISHMENT OF INDEPENDENT OFFICE

SEC. 3. (a) There is hereby created, as an independent agency of the Federal Government, the Office of Scientific and Technical Mobilization (hereinafter referred to as "the Office") which shall be administered by an Administrator to be appointed by the President, by and with the advice and consent of the Senate, and to serve at the pleasure of the President. The Administrator shall receive a salary at the rate of $12,000 a year. The Administrator shall appoint, fix the compensation, and define the authority and duties of such officers, employees, attorneys, and agents as he shall deem necessary to carry out the purposes and provisions of this Act and to transact the business of the Office. Such appointments shall be made in accordance with the provisions of the civil-service laws and regulations and the Classification Act of 1923, as amended: *Provided*, That when the Administrator determines it to be necessary in order to effectuate the purposes and provisions of this Act he may waive these requirements. The Office may make such reimbursement as it may deem necessary and proper for the traveling, subsistence, or other expenses incurred in the performance of official duties by its officers, employees, attorneys, agents, and by other persons or members of committees, boards, or other bodies designated by it to carry out such duties. The Office shall be located in or near the District of Columbia, but the Administrator may establish such branch offices outside of the District of Columbia area as may be required to carry out the purposes of the Act.

(b) Any person employed on a full-time basis by the Office shall receive no salary, wages, or other compensation from any source except the Office.

(c) There is hereby established within the Office a National Scientific and Technical Board (hereinafter referred to as the "Board") consisting of the Administrator, who shall be Chairman, and six other members, to be appointed by the President, and to include one representative each for industry, agriculture, labor, the consuming public, and two additional members at large who shall be scientists or technologists. Each such member shall receive compensation at the rate of $10,000 a year. The Board and its several members shall perform such duties under the direction and control of the Adminis-

trator as he may assign to them; they shall have access to all information of the Office relating to the administration thereof.

(d) There is hereby created a National Scientific and Technical Committee consisting of the Board, one representative each for each of such Federal departments as the President shall designate, four additional representatives of the consuming public, three additional scientists or technologists, and six additional members representing labor and six additional members representing management (including small business), in the major fields of production and service to be appointed by the President and to serve without compensation, to advise and consult with the Administrator, who shall be the Chairman thereof, upon the basic policies governing the administration of this Act. Such committee shall meet regularly, not less than once a month.

(e) There is hereby transferred to the Office the powers and personnel of the National Roster of Scientific and Specialized Personnel of the War Manpower Commission, together with its records, furniture, and equipment, and all its unexpended balances of appropriations or other funds available to carry out its powers and duties.

POWERS OF THE OFFICE

SEC. 4. To effectuate the purposes of this Act, the Office shall be vested with the following powers and duties which it shall exercise and perform under the direction and control of the Administrator:

(a) To take and keep a census of scientific and technical facilities, requirements, and personnel in the United States and its possessions and to provide archives for all scientific and technical material coming into the possession of the Government or any agency or department thereof.

(b) To formulate and promote projects and programs for the development and use of scientific and technical facilities and personnel and, when necessary, to initiate and carry out such projects.

(c) To foster and develop scientific and technical methods, to promote their application in the national welfare, either within the Office or by other auspices, public or private, and to promote and provide training and participation in science and in its application.

(d) To ascertain and assess scientific and technical developments in relation to, and to study their impact upon, the national welfare, or any particular category thereof.

(e) To solicit and to receive aid and support from any source for the advancement of scientific and technical methods.

(f) To coordinate the scientific and technical data, methods, and facilities of, or available to, all agencies and departments of the Federal Government.

(g) To foster international cooperation in scientific discovery and the application thereof; to acquire information with respect thereto from other countries and their nationals; to exchange scientific and technical personnel and information with such countries; and to engage in other suitable forms of international collaboration relating to science and technology.

(h) To make available, upon request, to the President, to the Congress, and to other persons or establishments (upon such conditions as the Administrator shall prescribe), technical guidance and assistance and any record or other data necessary therefor.

(i) To review specifications, standards, and designs of military and civilian products and services and their methods of production and supply and to recommend suitable simplifications and changes therein.

(j) To finance by loan, grant, exchange, purchase, or otherwise the operations or functions, or any of them, authorized by this Act, and, for the same purposes, to make or acquire any contract, guaranty, indemnity, stipulation, lease, or other instrument, to acquire, improve, and alter real and personal property, and to enter into any other transaction necessary or appropriate for the performance of its duties or powers.

(k) To acquire patents and patent rights, and to authorize the use thereof, subject to the provisions of section 7 of this Act, and to authorize the use or other disposition of any other property belonging to, or controlled by, the Office, upon such terms and conditions and for such compensation as the Administrator shall determine, which compensation shall be payable to the Office.

(l) To establish a system of merit awards to be granted to any agency, establishment, or person making any outstanding scientific or technical contribution to the national defense or the general welfare.

(m) To make, amend, and rescind appropriate rules and regulations to carry out the purposes of this Act and all the powers and duties vested in the Office, which rules and regulations shall have the force and effect of law.

(n) To avail the Office of the information, services, facilities, officers, and employees of any Federal establishment in carrying out the purposes and provisions of this Act.

(o) To conduct such research and investigation touching upon the use and development of scientific and technical facilities and personnel as the Office may deem necessary and appropriate to carry out the purposes of this Act.

MOBILIZATION OF PERSONNEL

SEC. 5. To mobilize scientific and technical manpower for the prosecution of the war and otherwise to carry out the purposes of this Act—

(a) Section 10 (a) of the Selective Training and Service Act of 1940, as amended, is further amended by adding at the end thereof the following:

"Any provision of this Act to the contrary notwithstanding—

"(1) whenever the Administrator of the Office of Scientific and Technical Mobilization deems it necessary, to carry out the purposes of the Science Mobilization Act, that occupational deferments be granted to persons engaged in any particular scientific or technical occupation or having or receiving any scientific or technical training, he shall certify to the Chairman of the War Manpower Commission that (1) such occupation or training is of a scientific or technical character, and (2) that it is critical in the war effort; and such Chairman shall thereupon approve or disapprove each such certification. In event of such approval, such Administrator shall there-

after determine, subject to such rules, quotas, schedules, and procedures as the Chairman of the War Manpower Commission may prescribe, the facts and circumstances pertinent to the occupational deferment of any person within the scope of such certification and whether any such deferment should be made;

"(2) any determination respecting occupational deferment made by the Administrator of the Office of Scientific and Technical Mobilization in accordance with the authority of this section, as amended, shall be conclusive upon all civilian local boards and any other civilian agencies functioning under this Act."

(b) During the existence of a state of war and for six months thereafter, the Administrator is authorized to prescribe and promulgate appropriate rules, regulations, procedures, and methods, subject to direction by the Chairman of the War Manpower Commission, for the training, classification, and employment of all scientific and technical personnel by any person, agency, or establishment, public or private.

MOBILIZATION OF FACILITIES

SEC. 6. To mobilize scientific and technical facilities for the defense of the United States and otherwise to effectuate the purposes of this Act—

(a) (1) During the existence of a state of war, whenever the Administrator determines, subject to review by the President, that (1) the use of any scientific or technical facility, or of any license, easement, privilege, or other right therein, is needed for the defense of the United States or the prosecution of the war; (2) such need is immediate and impending and such as will not admit of delay or adequate fulfillment by resort to any other source of supply; and (3) all other means of obtaining the use of such facility or of any right therein, upon fair and reasonable terms, for the defense of the United States or the prosecution of the war have been exhausted, he is authorized to requisition such facility and any right therein and to dispose of the same in such manner, not inconsistent with this Act, as he may determine to be necessary for the defense of the United States or the prosecution of the war upon the payment of fair and just compensation for such property to be determined in the same manner as provided in Public Law Numbered 274, Seventy-seventh Congress, as amended, except that the Administrator, subject to review by the President, shall make all determinations in the first instance, respecting fair value of such facility and right: *Provided*, That the requisitioning power herein granted shall not extend to any patent itself but shall be confined to licenses or any other right therein respecting user, together with the right to grant sublicenses.

(2) Whenever the Administrator determines that such facility or any right therein requisitioned pursuant to subsection (1) of this section is no longer needed for the defense of the United States or the prosecution of the war, he shall return the same to the person from whom it was requisitioned if such person desires return of the property or facility, in the same manner as provided respecting returns of requisitioned property in sections 1 and 2 of Public Law Numbered 274, Seventy-seventh Congress, as amended, except that no such return shall be required of the Administrator until six months after the termination of the state of war and that any determination of fair value made in connection with such return shall be made by the Administrator in the first instance, subject to review by the President.

(3) The Administrator shall include in his reports directed to be made under section 11 of this Act a separate part with respect to his operations under this subsection.

(b) During the existence of a state of war, the Administrator is authorized to conduct investigations of and concerning the scientific and technical facilities used or capable of use in war or essential civilian production or supply with the view to ascertaining and evaluating the factors affecting efficiency in such production or supply. The Administrator shall submit to the producers and suppliers concerned, and to all appropriate Federal establishments, his recommendations of any improvements disclosed by his investigations to be necessary or desirable for the national defense or the prosecution of the war.

(c) The Administrator is authorized to represent any agency or establishment before the War Production Board or any other appropriate Federal establishment upon any application for allocation of, and priority ratings for, any critical material and equipment for use in scientific and technical research and development. All such applications shall be made only by and through the Office pursuant to appropriate regulations to be prescribed by the Administrator and approved by the Chairman of the War Production Board.

PRODUCTION OF THE PUBLIC INTEREST IN DISCOVERIES AND DEVELOPMENTS FINANCED BY THE UNITED STATES

SEC. 7. (a) Any provision of law to the contrary notwithstanding, the Office is hereby vested with the exclusive right to use, and with the exclusive right to license others to use, (1) any invention, discovery, patent, or patent right which has heretofore resulted, or shall hereafter result, from research or invention for the carrying on of which the United States or any department, agency, or establishment thereof either has heretofore contributed at any time since the declaration of national emergency on May 27, 1941, or shall hereafter contribute, any money, credit, physical facilities, or personnel; and (2) any invention, discovery, patent, or patent right which is at the time of the enactment of this Act, or shall hereafter become, to any extent the property of the United States or of any department, agency, or establishment thereof.

(b) The Office is authorized, subject to such rules and regulations relating thereto as the Administrator may adopt, to grant to any department, agency, or establishment of the United States a nonexclusive license to use any invention, discovery, patent, or patent right which has been vested in the Office by virtue of the provisions of subsection (a) of this section.

(c) The Office is authorized to grant to others than a department, agency, or establishment of the United States a nonexclusive license to use any invention, discovery, patent, or patent right which has been vested in the Office by virtue of the provisions of subsection (a) of this section upon such terms and conditions, including

payment to the Office of a fee or charge for user, as the Administrator may prescribe: *Provided,* (1) That no such license shall be granted unless the Administrator shall first be satisfied and shall find that no monopoly, monopolistic practice, or unfair competitive advantage will be promoted thereby, and (2) that the charge for user prescribed by the Administrator shall either be a uniform nominal fee or a charge graduated to the volume of production resulting from user, or such other scale of charges that shall be necessary or desirable in order to effectuate the purposes of the preceding provisions.

(d) Any owner or assignee of, or any person having an interest in, any invention, discovery, patent, or patent right which has been vested in the Office by virtue of the provisions of subsection (a) of this section shall be paid fair and just compensation for any deprivation of property right resulting from such vesting, to be determined in the same manner as provided in Public Law Numbered 274, Seventy-seventh Congress, as amended, except that the Administrator, subject to review by the President, shall make all determinations in the first instance respecting fair and just compensation: *Provided,* That the Office is also authorized to make suitable compensation, as determined by the Administrator with the approval of the Board, to individual inventors or discoverers or to individuals contributing to inventions or discoveries including employees of the Federal Government, as a reward for their inventions or discoveries or for their contributions thereto when such inventions or discoveries are deemed by the Administrator to be in the national interest and when they are vested in the Office by the provisions of subsection (a) above.

(e) Except as otherwise specifically provided in this Act, neither the Administrator nor any other department, agency, or establishment of the United States shall sell, assign, grant, or otherwise dispose of any invention, discovery, patent, patent right, license, or license right, which has been or shall become vested, acquired, or retained by them or any of them and any transaction or arrangement in violation of this subsection shall be void and of no effect.

(f) The Administrator is hereby authorized and directed (1) to prescribe and promulgate appropriate rules and regulations which shall thereupon have the force and effect of law for the enforcement of the provisions of this section, and (2) to require and incorporate in all licenses, sublicenses, and other instruments and writings made in pursuance of provisions of this Act, such terms and conditions as shall apply the intent and purpose of this section to the facts and circumstances of the particular transaction.

INFORMATION

SEC. 8. (a) It shall be the duty of all persons and establishments, when so requested by or in behalf of the Administrator, to furnish, to the best of their knowledge, any information, data, or record concerning scientific and technical facilities during the existence of a state of war and concerning scientific and technical personnel at all times. Any person or establishment refusing or willfully failing to furnish the same or willfully making any false or fraudulent statement in answer to any such request shall upon conviction thereof, be fined not more than $5,000 or imprisoned for not more than one year, or both.

(b) The Administrator is hereby directed to maintain the secrecy or restricted character, as the case may be, of any information or data coming into his possession or control under this Act, which is declared to be secret or restricted by other provision of law or the secrecy or restriction of which the Administrator deems otherwise essential to maintain in the public interest. There is hereby established a committee to consist of one member each representing the War Department, the Navy Department, the Office, and any such other Federal establishments as the President may designate which shall advise the Administrator respecting any matter or measure necessary to carry out the purpose of this section.

FUNDS AND FINANCES

SEC. 9. (a) The sum of $200,000,000 is hereby authorized to be appropriated to carry out the provisions and purposes of this Act. Further sums are authorized to be appropriated as may be necessary and proper for the same purposes. Such sums or any part thereof, together with any moneys realized or received by the Administrator from his exercise of any power granted to him by this Act, may be designated and used at his direction as a revolving fund or otherwise to carry out any power so granted.

(b) Further to effectuate the purposes of this Act, the Administrator is authorized, whenever he deems it necessary and expedient, to create or to organize a corporation or corporations as instrumentalities for the more effective exercise and performance of his own powers and duties or those of the Office, or any part thereof. The Administrator may make loans to, or purchase in whole or in part from time to time, the capital stock of any such corporation for any purpose within the powers of the corporation, and on such terms and conditions as the Administrator may determine: *Provided,* That such capital stock shall be purchased and owned only by the Office.

SUBPENAS AND PENALTIES

SEC. 10. For the purposes of any investigations authorized by this Act, the Administrator and any official designated by him may administer oaths and affirmations, subpena witnesses, take evidence, and require the production of books, papers, and other documents which the Administrator or such officer deems to be relevant or material to the inquiry. Such attendance of witnesses and the production of such documentary evidence may be required from any place in the United States or any Territory or possession thereof at any designated place of hearing. In cases of contumacy by, or refusal to obey a subpena served upon any person, the district court for any district in which such person is found, resides, or transacts business, upon application by or on behalf of the Administrator, shall have jurisdiction to issue an order requiring such person to appear and give testimony or to appear and produce documents, or both; and any failure to obey such order of the court may be punished as a contempt thereof. Witnesses subpenaed under this section shall be paid the same fees and mileage as are paid witnesses in

the district courts of the United States. No person shall be excused from complying with any requirements under this section because of his privilege against self-incrimination, and the immunity provisions of the Compulsory Testimony Act of February 11, 1893 (U. S. C., 1934 edition, title 49, sec. 46), shall apply with respect to any individual who specifically claims such privilege. Any person who willfully violates any order, rule or regulation promulgated by the Administrator under the authority of this Act, shall, upon conviction thereof, be fined not more than $5,000 or imprisoned for not more than one year, or both.

PERIODIC REPORTS

SEC. 11. The Administrator shall render a report in writing to the President and to the Congress in January of each year summarizing the activities of the Office in the calendar year just ended and reporting on the status and progress of science and on scientific and technical problems affecting the public interest together with such recommendations as he may deem appropriate within the purposes of this Act. During a state of war, he shall make interim reports quarterly during each of the months of January, April, July, and October.

SEVERABILITY CLAUSE

SEC. 12. If any clause, sentence, paragraph, or part of this Act shall be adjudged by any court of competent jurisdiction to be invalid, such judgment shall not affect, impair, or invalidate the remainder thereof but shall be confined in its operations to the clause, sentence, paragraph, or part thereof directly involved in the controversy in which such judgment shall have been rendered.

# SOME OBSTACLES IN THE PATH TOWARDS AN OPTIMUM DIET. II

By Dr. A. J. CARLSON
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(G) *Poverty.* Many people are undoubtedly inclined to put poverty as obstacle No. 1, even on the road to a good or adequate diet not to say an optimum diet, and I am not quarreling with the relative importance of any of the factors, as I indicated in the beginning. Whatever the percentage of truth there is in the view that forty million, even a hundred million, Americans are badly nourished, there can be no doubt that financial handicaps may be serious enough to prevent the purchase and consumption of food adequate for good health. And even if only one per cent. of our fellow citizens belong in this category in this land of abundance of good foods, that would be a reflection on our wisdom and our competence. But among men, as among animals below man, securing food without labor, without scratching leads in the long run to deterioration.

Among the wants and fears of man in many lands are the lack of good foods and the fear of starvation. Sir John B. Orr, the British war-time food administrator, has recently proposed that this seemingly simple aspect of the "Atlantic Charter" should be our primary concern. But even this is by no means simple. For in absence of epidemics, all species, man included, tend to reproduce beyond the limits of an adequate food supply for all. So a necessary corollary to freedom from the want of good food, and freedom from the fear of starvation everywhere, is planned parenthood. To me at least, this seems as humane, reasonable and necessary as our civilized and scientific endeavors to prevent and control the other form of universal human suffering—disease.

The financially poor, the financially unfortunate appear to have been with us throughout recorded history. The common saying is: "The poor will always be with us." Maybe so, at least in a relative sense. For there is also poverty in foresight and poverty in individual endeavor. In so far as this is due to poverty in heredity, common sense seems to say that, as knowledge grows, we must apply new measures to decrease the production of chicks that chirp but can not or will not scratch. Unless reason based on understanding effectively guides social evolution of tomorrow in that direction, I see no escape from the degeneration that invariably follows biologic parasitism, except the ancient "law of tooth and claw." The killing of millions of pigs for fertilizer, and restricting the production of such important foods as wheat and corn, all by Federal regulation, do not (in my judgment) square with our concern for an optimum diet of man (the poor included), even in our own land.

(H) *Appetite.* We know to-day very much less about the precise mechanism of appetite for food than we know about the mechanism of hunger, but stated briefly, appetite for food in contrast to hunger does not seem to be primarily inherited. It seems to be a memory of previous pleasant experiences with foods, pleasant experiences in the sense of taste, odor and visual appearance of foods. One fact stands out clearly in the matter of appetite, and that is this: All normal people seem to be able to acquire a liking or appetite for any kind of substance that can serve the nutrition of man. This, I think, is a factor of safety as well as a factor of danger for the human dietary.

The factor of safety appears in the human capacity for omnivorousness, that is, consumption of a great variety of foods. The dislike for or actual revulsion to a monotonous diet is a drive towards variety, if not omnivorousness in foods. There is no doubt that this tendency or habit of omnivorousness will in part explain the dietary success of our forebears and of wild animals, in the absence of specific understanding of food requirements. On the other hand, there is danger in combining the products of human ingenuity in the matter of food processing and food preparation with the capacity to develop liking for foods that are so defective in essential elements that when they are made a preponderant part of our diet, we may develop serious malnutrition. Three of such common foods today are the refined sugars, polished rice and bread made out of our modern patent flour. These are good foods. We can, and we have developed appetite for them, but because of refinement, they are so defective in many essential dietary elements that they can lead, in fact they have led, to nutritional disaster when they make up too large an element in our overall food consumption. I think it is particularly important to recognize the safety in dietary omnivorousness, to recognize the fact that we can and should develop liking for, that is appetite for, a great variety of foods as soon as feeding at the breast or by bottle is supplemented by the common foods of man, because these likings or appetites are probably most easily established in the early years of life. When good food is abundant the gray squirrel eats the germ in the grain of corn and discards the rest. We eat the rest and discard the germ. The pregnant and lactating squirrel (a herbivore) eats bones, when she can get them. So do cattle (other herbivores) ranging on land poor in lime. We do not know when or how these primitive appetites were lost to or suppressed in man.

The vagaries of appetite may lead to malnutrition in two directions. It may lead to eating too little (anorexia nervosa) or eating too much. The chronic and serious depression of appetite usually has a psychological basis both in children and in adults; in fact it may follow a period of such great appetite that the person is eating to marked obesity. The criticisms and the ridicule of this obesity by the obese person's friends and associates may ultimately bring on such a mental state that for weeks, months and years, the eating of the very best of foods leads to vomiting. Fortunately these cases are not numerous, but obviously the cure here is neither more money, more food or better education as to foods. Perhaps the most serious aspect of the vagaries of appetite as an obstacle on the path towards optimum nutrition is that condition where the pleasures at the table so dominate in the individual's life that eating to the point of obesity follows. To be sure obesity may parallel an incipient malnutrition of factors other than calories in the diet, but I repeat, in the experimental animals at least, chronic deficiency in any one essential dietary factor impairs or retards both growth and weight. Since obesity is more than twice as prevalent in the American population as is underweight of equal degree, maybe we should give more attention than we have up to date to this aspect of malnutrition because, depending on the degree of obesity, this condition is a strain on the body reserves, renders man less fit for many tasks, and shortens his life span.

(I) *Chronic alcoholism.* As a food alcohol is among the most defective and most expensive of our foods. Curiously, alcohol in moderation is not infrequently taken before or with the meals with the avowed purpose of easing or aiding appetite and digestion. No animal below man seems to need this stimulus, although it is proven that moderate amount of alcohol does increase the secretion of gastric juice whether or not we need that increased amount of gastric juice. It is well known that alcohol, acting both on the alimentary canal and possibly also on the central nervous system, may induce temporary nausea, vomiting, anorexia and intolerance for foods. This is not a serious aspect when we think in terms of malnutrition. This comes in only in the case of those people who indulge in alcohol to excess and so constantly that consumption of food for adequate health is impaired, presumably by impairment of brain function, although action of chronic alcoholism in this direction on the alimentary canal and other organs of the body can not be excluded. Obviously the cure of this form of malnutrition lies neither in supplying more or better food or more cash for the latter would be likely spent for more alcohol. This malnutrition is obviously secondary to chronic alcoholism and this in turn may stem from hereditary as well as social forces that so far as we know to-day do not spring from any form of malnutrition.

(J) *Myopic federal state laws and regulations limiting free production, transportation and sale of good foods.* A writer has called these federal and state laws and regulations "state barriers for starvation." I have before me a list of these federal and state penalties on good foods. There is a federal tax of ten cents per pound on colored margarine. This effectively prohibits the sale of this margarine in the United States. The experience in Europe and in the United States goes to show that margarines palatable and of a nutritious value, in all probability not inferior to good butter, can be made out of vegetable fats or animal fats other than that in milk. Such margarines can and usually are fortified by the ad-

dition of the vitamins present in milk fats. We usually add a non-toxic color to winter butter without either labeling or taxing it, but when this color is added to margarines our federal government taxes it at ten cents per pound. Ostensibly this law was enacted for the protection of the consumer against deception. That phase can be taken care of by labeling, for most Americans can read. Actually the law was forced on our country by a pressure group, and I fail to see where the law works in the interest of our fellow-citizens in the lowest income group. Were all federal and state restrictions on good margarines swept overboard good margarine could probably be made and sold at half the cost of good butter. It appears that thirty states have themselves absolute prohibition against the sale of colored margarine. Twenty-nine states prohibit the importation of so-called "filled milk." This food is a combination of skimmed milk and animal or vegetable fats other than butter fat. This food, like margarine, can be and usually is fortified with the vitamins found in good condensed milk. Northern dairy states discriminate against margarine and "filled milk." Southern states retaliate by restricting dairy food from the northern states. It appears that several states recently have forced higher prices on dairy food by requiring inspection at the source of supply by officials of the importing state, an inspection duplicating that of the producing state. While these laws and regulations, state and federal, are dictated by selfish interests rather than the dietary welfare of the nation as a whole, they probably do not play a large role in the malnutrition existing in our country in terms of number of people, except among the poor. But it should also be said that any remedial measure tending to promote a good diet even for the poorest of our citizens should not be overlooked in our overall program for national nutritional welfare.

(K) *Wishful thinking or worse.* Even at the risk of concluding this discussion on "a sour note" I designate the last "obstacle" wishful thinking or worse. We, the laborers in science, must examine our moorings, lest mirages and miracles replace proven reality, and we too become the blind leaders of the blind. I know as yet of no dietary factor automatically assuring even in a man of science the rule of reason every day.

A high-ranking Government official in Washington said recently: "Defective stamina, intelligence, judgment, will, stability, can be treated by doses of synthetic vitamins." Since this administrator is neither a chemist, biologist nor physician, the information on which this extraordinary assertion is made must have been supplied by some one of our scientific colleagues, on whom rests the primary responsibility. Treated? Yes. These and other human impairments have had their therapies by the thousands. We all can "call the spirits from the vasty deep." But, do they come when we call them? If treated means treated with proved success, then it seems that a fractional potential has been turned into a universal affirmative. A cautious working hypothesis, such as the following—"deficient diets, short of producing a full-blown deficiency disease, may be responsible for such vague symptoms as mental depression, indigestion, easy fatigue, loss of weight, retarded learning ability and impaired vision"—is turned a proven fact, without further evidence. The administrator supports his statement with the following tale: "Recently I was told that a western trucking company had actually achieved a reduction of its night accident rate by providing all its drivers with bags of raw carrots at the beginning of each trip." We are not told what the truck drivers did with those bags of carrots. Did they hang them around their necks, or did they chew and swallow them? Or was this little item not checked? If they chewed the carrots, somebody who knows should have told those concerned that chewing carrots or chewing the rag are aids to keeping awake, no matter what either may do for the rhodopsin of the retina in the way of better vision in faint light. I know of no statistics showing what factor drowsiness, apart from poor vision (night blindness), plays in the safe operation of trucks at night. Some years ago a New York physician reported improvement in the scholastic record of New York City's backward children by feeding them extracts of the pineal gland. That "promising" therapy seems to have passed on. Now, vitamin pills perform these miracles, apparently even when heredity has been niggardly, and accidents and disease have left their marks on the unfortunate individual.

We are told by a colleague in chemistry: "It is recognized already that one vitamin can and does cure mental derangements." This is stated without qualifications, while as a matter of fact mental derangements are due to a great diversity of factors, including heredity, mechanical and chemical trauma and cerebral ischemia. The value of the vitamin B complex in mental derangements seems to be largely limited to those accompanying advanced pellagra and chronic alcoholism. The 1942 faith and hope in universal health miracles from synthetic vitamin pills seem premature, if not immature. When I see our institutions for the feeble-minded and the insane evacuated and closed by giving any or all of our 1942 variety of vitamin pills to these unfortunate fellow citizens I, too, will sing "Hosanna to the Highest." This scientist goes on to say: "Good diets, which mean an abundant supply of vitamins, promote in-

tellectual keenness. . . . There can be no doubt that much dullness on the part of school children . . . can be traced in part to lack of the proper kind of food and especially lack of enough vitamins." These are broad and important generalizations. But I know of no evidence that an ample ingestion of vitamin pills will materially improve the scholastic record of the millions of children and young adults in our schools. These assertions are just too good to be true. Human biology is not that simple.

Another colleague in chemistry tells us that the Germans "have enjoyed a more generous supply of thiamin and other vitamins which grains provide than have Scandinavia, the Low Countries, France, Spain, Italy or the British Isles. Perhaps pacifism is a product of malnutrition." Yes, the god "Mars" is traditionally pictured as a well-nourished specimen, and if good nutrition leads to war, and malnutrition to the striving for peace, what kind of diet has enabled man to discover the scientific method, to develop a sense of justice, a spirit of fair play, a love, respect and preference for truth and individual honesty? Are modern science and modern education sequelae of malnutrition?

Recently a subcommittee on medical nutrition of the National Research Council presented a report on malnutrition, under the heading, "Recognition of Early Nutritional Failure," and with two tables of signs and symptoms. I fully agree with this committee when it says: ". . . there is imperative need for (a) determination of the actual incidence of early deficiencies among the general population and for (b) the establishment of satisfactory diagnostic criteria for the recognition of such conditions." But after tabulating no less than twenty-nine alleged signs and symptoms of early or incipient dietary deficiencies that even laymen might observe and diagnose, the committee seems to wipe out its entire tabulation and report by this statement: "Implicit in the definition of the problem and in the foregoing statements is the fact that no symptoms or physical signs can be accepted as diagnostic of early nutritional failure. Certain symptoms and physical signs, however, when verified by a competent physician and when other possible causes have been ruled out, should be considered as significant indications." If this latter statement is true, and I subscribe to it, their tabulation is misleading, if not false *in toto,* in so far as present known facts of incipient dietary deficiencies are concerned.

The committee lists lack of appetite as a sign of incipient malnutrition. This is contrary to my experience, both in man and in animals. I saw hundreds of thousands of undernourished people on the continent of Europe in the winter of 1919, but, unless moribund, these people were eager for good foods. They eat the most unappetizing foods. At the end of over forty days of complete starvation a person, otherwise normal, has an appetite for food keener than at the start of the fast. I have had dogs, for various research purposes, fast much longer than forty days. At the end, or towards the end of these long fasts, these dogs grab food eagerly. To be sure, the rat on a diet deficient in the vitamin B complex will after a while eat less and less of this ration. But it will, unless moribund, eat a better ration. So appetite is not lacking. But it is clear that appetite for food being impaired by any cause will ultimately lead to malnutrition.

The alarming claim (100,000,000 Americans do not have a good diet) for national malnutrition in our land appears to be based primarily upon a series of surveys conducted by the Bureau of Home Economics of our Federal Department of Agriculture. These surveys embraced some 4,000 urban and village families of various levels of income and some 2,000 rural families of varying levels of income, selected from representative regions of our country. The surveys consist in reports from these families as to how much money they spent for food and what kinds of food were bought and, in the case of rural families, how much and what kind of food they consumed from the crops on their own farms. These field investigators had to take or did take the people's word for all these alleged facts. It is impossible to determine the degree of accuracy as to memory of whatever member of these families gave the facts or alleged facts to the enumerators. The precarious character of such data should have been apparent to any scientist who is free to work and think.

On the basis of the kind and quantity of the food bought or grown on the farms, the Bureau of Home Economics estimated the diets of these families as excellent, good, fair or poor. No physical or medical examination was made of the members of these families. Not even such a simple physical fact as the determination of the body weights of the people involved seems to have been undertaken. The necessity of such checks should also have been evident. The value of these statistics must largely be left up in the air as regards evidence for good or bad nutrition in our country by neglecting such an obvious factor as medical evidence of the health status of the people concerned, even though examination would have disclosed only advanced malnutrition.

How does Dr. Parran's interpretation of these statistical studies by the U. S. Bureau of Home Economics check with data from other sources? Hospital

statistics (admission, mortality rate) do not reveal significant national malnutrition in the United States, except for pellagra in the South. Of course, the mortality statistics reveal only terminal malnutrition, and admission statistics tell us only of malnutrition recognizable by present tests. Chronic malnutrition shortens the life span, but last year the average length of life of our citizens reached an all-time high or 63.42 years. There is some statistical evidence that our children are growing faster and taller than in the past, that college freshmen are taller than a decade or more ago. Children and youths do not grow faster or taller on inadequate diets. But we admit freely that these statistics do not cover our entire population. They are, however, indices. Malnutrition on a national scale does not lead to obesity, quite the reverse. This is certainly true of the experimental animal. And that was my observation in the war-devastated countries in Europe at the conclusion of World War I. Recent studies by the Life Extension Examiners show that 10 per cent. or more overweight is nearly three times more prevalent (28 per cent.) in the United States than 10 per cent. or more underweight (12.8 per cent.). It is a curious coincidence that the percentage of obesity in our people should come so close to Dr. Parran's estimate of the people having a good diet (25 per cent.). The obese may enjoy a good diet, but they do not use it wisely. Apart from pellagra, perhaps obesity is the most serious aspect of malnutrition in our country.

If 100,000,000 Americans, in times of peace and food plethora, had poor diets, that should have been revealed on medical examination of our millions of young men for our Army and Navy. All these data are not yet assembled and analyzed, but according to Dr. Rowntree, the first 800,000 men, age 21 to 35, examined in the 1941 U. S. Army draft had an average height of 67.5 inches, or exactly the same average height as our drafted men in World War I. But the 1941 men were on the average eight pounds heavier than the Army men of 1917–1918. We do not know whether these eight pounds represent muscle, bone or fat. These data on the 1941 draftees do not point towards an overwhelming malnutrition in our country. This should give us some assurance and some happiness. But we should not be content, we should not rest on the oar until we have discovered more adequate tests of incipient malnutrition; until we have cleared our land of myopic food practices; until we see dawn of understanding dispelling our fog of ignorance as to the nature of health and the nature and role of foods; until we have reached first base, at least, in driving pellagra from our homes. We have sufficient knowledge both as to causes, prevention and the cure of pellagra. We have the food to do it. And yet we have made scarcely a dent on this national disgrace. No, my fellow citizens, the day of rest and contentment for the students of human health is out of sight in war, and will not be in sight with peace. For this road is long, tortuous and difficult.

# SCIENTIFIC EVENTS

## RESOLUTIONS PASSED BY THE HOSPITAL BUREAU OF STANDARDS AND SUPPLIES

THE resolutions given below were passed at the annual meeting of the Hospital Bureau of Standards and Supplies held in New York City on February 25, at the conclusion of the address on "Hospitals and the War Program," by Maury Maverick, chief of the Bureau of Governmental Requirements of the War Production Board, Washington, D. C.

RESOLUTION I

WHEREAS, all resources of the nation should be used to the best advantage toward a successful and efficient prosecution of the war, and

WHEREAS, this nation must be prepared to provide full and complete hospital care and rehabilitation of the wounded of the services as well as for civilians, and

WHEREAS, the fullest possible utilization of existing government and civilian hospitals is desirable for the purpose of conserving manpower and critical materials,

*Be it Resolved,* therefore, by this organizatiou that the President of the United States be requested to appoint a commission to study the problem of the most efficient use of the country's hospitals in connection with the war, this commission to consist of representatives active in the management of voluntary, public and governmental hospitals and national health agencies, with authority to secure adequate professional assistance to advise the commission in regard to technical matters arising in connection with the study, and

*Be it Further Resolved,* that this commission be authorized to make a comprehensive report with such recommendations as may appear to it to be wise, and

*Be it Resolved,* that this commission be also authorized to investigate other problems affecting hospitals in connection with the war, such as construction, personnel shortages, food rationing and shortages of materials and equipment, to the end that the people of the nation, both in military service and in civilian life, may be afforded adequate hospitalization facilities and services to protect the health of the nation.

This resolution was endorsed at the meeting of the Greater New York Hospital Conference on February 26. It is now being referred to James A. Hamilton, president of the American Hospital Association, for

such action as his organization deems proper to take in connection with it.

RESOLUTION II

WHEREAS, there is now a wide diversification in sizes, styles and qualities of many categories of hospital supplies and equipment,

WHEREAS, this diversification results in less efficient production methods, more man hours per unit and wastage in the utilization of materials in the manufacture of the product,

WHEREAS, the purchase and use of supplies and equipment in a wide variety of styles, sizes and qualities results in inefficient utilization in institutions and a loss in effective purchasing methods,

WHEREAS, such reduction in efficiency in the production and consumption of this material should not be tolerated during the war period,

*Be it Resolved*, therefore, that the Hospital Bureau of Standards and Supplies promote in every way possible and assist all government agencies working on the problem of the simplification and standardization of hospital goods to the end that wastage of materials and man hours be reduced as far as possible.

## THE MERCK INSTITUTE FOR THERAPEUTIC RESEARCH

ACCORDING to information received from Merck and Co., Inc., the tenth anniversary of the opening of the Merck Institute for Therapeutic Research was celebrated with appropriate ceremonies on April 26. Following the exercises a dinner was held at the Essex House in Newark. George W. Merck, president of Merck and Co., Inc., presided and introduced the speakers.

Among these were Dr. William H. Sebrell, chief of the division of chemotherapy of the National Institute of Health and assistant director of nutrition for the Defense, Health and Welfare Services in Washington; Dr. Francis G. Blake, dean of the Yale Medical School and chairman of the Subcommittee on Infectious Diseases of the National Research Council; and Dr. Russell M. Wilder, professor of medicine, the Mayo Clinic.

Messages of congratulation were received from Sir Henry Dale, president of the Royal Society, London, and Dr. Alfred N. Richards, vice-president in charge of medical affairs of the University of Pennsylvania Medical School and chairman of the Committee on Medical Research of the Office of Scientific Research and Development, Washington.

The Merck Institute for Therapeutic Research, a non-profit corporation under the laws of the State of New Jersey, was founded in 1933 for the purpose of conducting investigations into the causes, nature and mode of prevention and cure of diseases in men and animals. The determination of the therapeutic value and safety of new drugs is one of its principal duties.

During the afternoon ceremonies in the institute building, the tenth annual report was presented by the director, Dr. Hans Molitor. Dr. Molitor pointed out that, since 1933, the size of the Merck Institute has increased almost six times, and its personnel eighteen times. The new three-story laboratory building, which is completely air-conditioned and equipped with up-to-date facilities, was occupied two years ago. Vitamins and chemotherapy are the principal fields of research. Since the outbreak of the war, only problems of immediate importance to the war effort have been permitted to remain on the research program. Notable among these are penicillin and new antimalarial products.

## THE COPERNICAN QUADRICENTENNIAL CELEBRATION

DR. STEPHEN P. MIZWA, director of the Kosciuszko Foundation and secretary of the Copernican Quadricentennial National Committee, is arranging for a national scientific tribute to Nicholas Copernicus. This will take place in Carnegie Hall, New York, on Monday evening, May 24. Reservations for boxes and tickets are now available at the headquarters of the Kosciuszko Foundation, 149 East 67th Street, New York.

Dr. Harlow Shapley, professor of astronomy and director of the Harvard College Observatory, chairman of the Copernican Quadricentennial National Committee, will preside. He will be introduced by Dr. Henry Noble MacCracken, president of Vassar College, and also president of the Kosciuszko Foundation since its organization in 1925 for the promotion of intellectual and cultural relations between the people of Poland and the United States.

In announcing the program of events for the Carnegie Hall meeting Dr. Mizwa said: "Nicholas Copernicus, the famous Polish astronomer of the sixteenth century, is internationally recognized as one of the world's great intellectual pioneers. His revelation of the heliocentric, or Copernican, system of astronomy in his epoch-making treatise, 'De Revolutionibus Orbium Coelestium,' published in 1543, revolutionized man's outlook upon the universe and introduced the era of modern science."

An international broadcast from London is planned with greetings from Sir Henry Hallett Dale, president of the Royal Society. His Excellency Jan Ciechanowski, ambassador of Poland at Washington, will present a message from the president of the Republic of Poland. Brief scientific addresses will be delivered by Dr. Joel Stebbins, president of the American Astronomical Society, professor of astronomy at the University of Wisconsin and director of Washburn Observatory; the Reverend Father Michael J. Ahern, S.J., senior professor of science at Weston College,

Massachusetts; Dr. Oscar Haleski, formerly professor of history at the University of Warsaw, at present director of the Polish Institute of Arts and Sciences in New York, and Dr. Edward Rosen, Copernican scholar and instructor in history at the College of the City of New York.

Musical features will include the traditional Polish "Hejnal" or "The Broken Note Signal," dating from the legendary trumpeter of Krakow in the thirteenth century, whose warning saved the city from the Tartar invasion; the national anthems of the United States and Poland, and the Gaude Mater Polonia, Alma Mater song of the University of Krakow, sung by the Schola Cantorum of New York, and solo selections by Wanda Landowska, Polish harpsichordist, and by Bronislaw Huberman, Polish violinist.

## THE AMERICAN PHILOSOPHICAL SOCIETY

AT the annual general meeting of the American Philosophical Society, held in the hall of the society at Independence Square, Philadelphia, on April 22, 23 and 24, the following officers were elected:

*President,* Edwin G. Conklin.

*Vice-presidents,* Frederick P. Keppel, Edward P. Cheyney, Thomas H. Morgan.

*Secretaries,* W. F. G. Swann, Ernest M. Patterson.

*Curator,* John Story Jenks.

*Treasurer,* Fidelity-Philadelphia Trust Company.

*Councillors,* Arthur B. Coble, *Class I;* Herbert S. Gasser, *Class II;* Edmund E. Day, *Class III,* and Frank Aydelotte, *Class IV.*

The following twenty-seven resident and five foreign residents were elected:

### MATHEMATICAL AND PHYSICAL SCIENCES

Raymond Thayer Birge, professor of physics, University of California

Samuel Colville Lind, dean, Institute of Technology, University of Minnesota

Donald Howard Menzel, associate professor of astrophysics, Harvard University

Marshall Harvey Stone, professor of mathematics, Harvard University

Merle Antony Tuve, chief physicist, Department of Terrestrial Magnetism, Carnegie Institution of Washington

Frank Clifford Whitmore, dean, School of Chemistry and Physics, Pennsylvania State College

*Foreign*

Sir William Lawrence Bragg, Cavendish professor of experimental physics, University of Cambridge

Luitzen Egbertus Jan v. Brouwer, professor of mathematics, University of Amsterdam

Godofredo García Díaz, professor in the faculty of sciences of the University of San Marcos, Lima

### GEOLOGICAL AND BIOLOGICAL SCIENCES

Rollin Thomas Chamberlin, professor of geology, University of Chicago

Ralph Works Chaney, professor of paleontology and chairman of the department of paleontology, University of California

Hans Thacher Clarke, professor of biochemistry, Columbia University

Leslie Clarence Dunn, professor of zoology, Columbia University

Ernest William Goodpasture, professor of pathology, Vanderbilt University

Warren Harmon Lewis, member, Wistar Institute of Anatomy and Biology

George Linius Streeter, director, department of embryology, Carnegie Institution of Washington (retired)

### SOCIAL SCIENCES

Julian Parks Boyd, librarian, Princeton University

Douglas Southall Freeman, editor, *Richmond News-Leader*

Owen Lattimore, lecturer, director, Walter Hines Page School of International Relations, the Johns Hopkins University

Henry Allen Moe, secretary-general, Guggenheim Memorial Foundation

Walter W. Stewart, professor, School of Economics and Politics, Institute for Advanced Study, Princeton, N. J.

Quincy Wright, professor of international law, University of Chicago

### HUMANITIES

William Ernest Hocking, Alford professor of philosophy, Harvard University

Fiske Kimball, director, Philadelphia Museum of Art

Charles Grosvenor Osgood, professor emeritus of English, Princeton University

Erwin Panofsky, professor of the history of art, Institute for Advanced Study, Princeton, N. J.

Mary Hamilton Swindler, professor of classical archeology, Bryn Mawr College

George Clapp Vaillant, director, University Museum, University of Pennsylvania

*Foreign*

John Davidson Beazley, professor of classical archeology, University of Oxford

Alan Henderson Gardiner, editor, *Journal of Egyptian Archeology,* London

### COUNCIL NOMINEES

Chester Irving Barnard, president, New Jersey Bell Telephone Company

Henry Agard Wallace, Vice-president of the United States

## THE NATIONAL ACADEMY OF SCIENCES

ELECTIONS at the spring meeting of the National Academy of Sciences, held in Washington on April 26 and 27, are:

*President,* Dr. Frank B. Jewett, New York City, reelected for a further term of four years, ending June 30, 1947.

*Home Secretary,* Dr. F. E. Wright, 2134 Wyoming Avenue, Washington, D. C., reelected for a further term of four years, ending June 30, 1947.

*Members of the Council* (terms, three years ending June 30, 1946), W. Mansfield Clark, Johns Hopkins

Medical School, Baltimore (reelected); Walter R. Miles, Yale University School of Medicine (succeeding Oswald Veblen).

*New Foreign Associates:*

Alfonso Caso, Instituto Nacional de Antropologia e Historia, Mexico City

Harold Spencer Jones, Royal Observatory, Greenwich, England

Richard Vynne Southwell, Brasenose College, University of Oxford

Charles Edward Spearman, University of London

Sir D'Arcy Wentworth Thompson, University of St. Andrews

Hendrik Johannes van der Bijl, University of Pretoria, South Africa

*New Members:*

Leason Heberling Adams, Geophysical Laboratory, Carnegie Institution of Washington

Abraham Adrian Albert, University of Chicago

Jesse Wakefield Beams, University of Virginia

Arthur Francis Buddington, Princeton University

Leonard Carmichael, Tufts College, Medford, Mass.

William Henry Chandler, University of California at Los Angeles

Edwin Joseph Cohn, Harvard Medical School

John Nathaniel Couch, University of North Carolina

Theodosius Dobzhansky, Columbia University

Lee Alvin DuBridge, University of Rochester

Leslie Clarence Dunn, Columbia University

Wallace Osgood Fenn, University of Rochester

Paul Darwin Foote, Gulf Research and Development Company, Pittsburgh, Pa.

Louis Plack Hammett, Columbia University

William Vermillion Houston, California Institute of Technology, Pasadena

Walter Pearson Kelley, Citrus Experiment Station, Riverside, Calif.

Warfield Theobald Longcope, the Johns Hopkins University

Eli Kennerly Marshall, Jr., the Johns Hopkins Medical School

Leonor Michaelis, Rockefeller Institute for Medical Research, New York City

William Albert Noyes, Jr., University of Rochester

Oswald Hope Robertson, University of Chicago

Carl-Gustaf Arvid Rossby, University of Chicago

Calvin Perry Stone, Stanford University

Charles Vincent Taylor, Stanford University

Hubert Bradford Vickery, Connecticut Agricultural Experiment Station, New Haven

Vladimir Kosma Zworykin, RCA Manufacturing Company, Camden, N. J.

## RECENT DEATHS

DR. H. GIDEON WELLS, professor emeritus of pathology of the University of Chicago, died on April 26 at the age of sixty-seven years.

DR. GEORGE MCPHAIL SMITH, professor of inorganic chemistry at the University of Washington, died on April 6 at the age of sixty-four years.

DR. LOUIS AGASSIZ TEST, until his retirement in 1941 for twenty-three years professor of chemistry at Purdue University, died on April 23. He was sixty-eight years old.

DR. ALBERT P. BRUBAKER, professor of physiology and medical jurisprudence at Jefferson Medical College, Philadelphia, from 1909 to 1927, a member of the faculty for fifty-three years, died on April 29 at the age of ninety years.

# SCIENTIFIC NOTES AND NEWS

THE Theobald Smith Award of $1,000 and a bronze medal of the American Association for the Advancement of Science, established by Eli Lilly and Company in 1935, has been given to Dr. Sidney C. Madden, assistant professor of pathology at the School of Medicine and Dentistry of the University of Rochester, in recognition of his work on "Plasma Proteins."

THE Civic Medal, awarded annually by the Rochester Museum Association, will be presented on May 13 to Dr. George H. Whipple, dean of the School of Medicine and Dentistry of the University of Rochester.

THE Board of Directors of the Sociedad de Agricultores de Colombia has named the following as corresponding members: Dr. Alexander Wetmore, assistant secretary, Smithsonian Institution; Dr. Edward A. Chapin, curator of insects, U. S. National Museum; Dr. Ellsworth P. Killip, associate curator, Division of Plants, U. S. National Museum; Dr. C. P. Clausen, principal entomologist, in charge of Importation of Natural Enemies used to Control Insect Pests, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture; Dr. H. Atherton Lee, director, Insular Experiment Station, Mayaguëz, Puerto Rico.

ALFRED C. WEED, for the past twenty-two years curator of fishes at Field Museum of Natural History, Chicago, retired on April 30. A farewell reception was held in his honor by fellow workers, who presented him with bound volumes of his writings in both the scientific and popular fields.

THE Executive Committee of the American Society of Zoologists, by mail ballot, have elected the following officers proposed by the nominating committee: *President,* Professor T. S. Painter, University of Texas; *Vice-president,* Professor L. H. Snyder, the Ohio State University; *Secretary,* Dr. L. V. Domm,

the University of Chicago, three years; *Member of the Executive Committee,* Professor L. L. Woodruff, Yale University, five years.

AT the business meeting on April 14 of the Illinois Institute of Technology Chapter of the Society of the Sigma Xi, the following officers were elected for the coming year: *President,* Dr. Paul L. Copeland, professor of physics; *Vice-president,* Dr. Max Jacob, research professor of mechanical engineering; *Secretary,* Dr. Hugh J. McDonald, assistant professor of chemistry; *Treasurer,* Dr. Leslie R. Hedrick, associate professor of biology. Dr. Henry Eyring, professor of chemistry at Princeton University, addressed the chapter on "The Drift Toward Equilibrium."

DR. O. S. MORGAN, professor of agriculture at Columbia University and head of the department, and E. B. Phelps, professor of sanitary science, a member of the faculty of the College of Physicians and Surgeons, will retire at the close of the academic year.

DR. WILLIAM T. MARTIN, of the Massachusetts Institute of Technology, has been appointed head of the department of mathematics at Syracuse University.

DR. RALPH E. WHEELER, assistant professor of preventive medicine and public health at Vanderbilt University School of Medicine, has been appointed to the newly established professorship of bacteriology of the Medical School of Tufts College.

IT is stated in *Nature* that Professor W. M. Macmillan, who has been working for the past two years in the Empire Intelligence Section of the British Broadcasting Corporation, has been selected by the British Council to act as its representative in West Africa. He will leave for the West Coast as soon as possible. His appointment follows a survey recently made by C. A. F. Dundas, the British Council's representative in the Middle East. It is hoped to establish institutes in the four West African Colonies, to serve as intellectual and cultural centers and to demonstrate the progress made in Britain in the fields of science, pure and applied, literature, art, music and drama. The necessary executive staff is now being assembled.

MAJOR JOHN D. GUTHRIE retired from the U. S. Forest Service on April 30, after having served for thirty-eight years, over two years of which were spent with the American Expeditionary Forces in France and Russia. Major Guthrie was a forest supervisor for some ten years in Arizona and New Mexico and later an assistant regional forester for public relations at Portland, Ore. He will reside in southside Virginia, where he will farm, practice forestry and write.

DR. ALLEN O. WHIPPLE, chief of the surgical division of the Presbyterian Hospital, New York; Brigadier General Frederick H. Osborn, of Garrison, N. Y., now chief of the Special Services of the War Department, and Harvey S. Firestone, Jr., vice-president of the Firestone Tire and Rubber Company, Akron, Ohio, have been elected charter trustees of Princeton University.

DR. HARRY STANLEY ROGERS, president of the Polytechnic Institute of Brooklyn, formerly dean of engineering at Oregon State College and director of the Engineering Experiment Station, has been appointed a member of the New York City Board of Higher Education.

WESLEY C. L. HEMEON, who has been industrial hygiene engineer for the Massachusetts Department of Labor for the past seven years, has become a member of the staff of the Industrial Hygiene Foundation of the Mellon Institute, Pittsburgh.

JOHN FARLEY FOSTER, research chemist for the General Electric Company, Pittsfield, Mass., has been appointed a member of the research staff of the Battelle Memorial Institute, Columbus, and has been assigned to the division of fuels research.

NICHOLAS N. T. SAMARAS and Roy W. Sudhoff, of the Central Research Department of the Monsanto Chemical Company, Dayton, Ohio, have become assistant directors.

DR. J. ROY DOTY, of the Louisiana State University, has been appointed associate chemist in the bureau of chemistry of the American Dental Association.

IT is reported in *Chemical and Engineering News* that G. Potapenko, since 1930 associate professor of physics at the California Institute of Technology, has been appointed technical director of the Aircraft Specialties Company, Los Angeles. He was formerly professor of mining and agriculture at the University of Moscow.

DR. EDGAR A. DOLL, who has been director of the department of research at the Vineland Training School since 1925, has been chosen director of Bonnie Brae Farm for Boys at Millington. For the past seven years he has served Bonnie Brae Farm as consultant psychologist.

DEAN CURRIER MCEWEN, of the New York University College of Medicine, has been granted leave of absence for military duty as lieutenant colonel in the Medical Corps of the U. S. Army. He will serve as executive officer of the Bellevue Hospital Affiliated Unit, the First General Hospital, now in training at Fort George G. Meade, Md. During his absence, Dr. Donal Sheehan, professor of anatomy, will act as dean and Dr. Clarence E. de la Chapelle, professor of clinical medicine, will act as assistant dean in the place of Dr. John H. Mulholland, who was granted military

leave last October to take charge of the Surgical Service of the Bellevue Unit.

DR. GEORGE SPERTI, director of the Institutum Divi Thomae, launched his ocean-going laboratory on April 5 to explore the east and west coastal waters of Florida for algae and seaweeds which yield agar.

DR. JOHN B. LUCKE, associate professor of geology at the University of Connecticut and head of the department, has been granted leave for the duration of the war to accept a commission as lieutenant (jg) in the U. S. Naval Reserve, with orders to report to the headquarters of the Eastern Sea Frontier, New York City.

DR. FRANZ WEIDENREICH, of the American Museum of Natural History, spoke on April 21 on the "Ancestry of Man in the Light of Latest Discoveries" before the annual initiation meeting of the Syracuse Chapter of the Society of Sigma Xi.

EXAMINATIONS are announced for positions in the West Virgina State Health Department, applications for which will be accepted continuously. New registers will be established from applicants who file not later than June 26. These positions for which applications are now being accepted, together with salary ranges, are as given below. Appointments may be made at above the minimum salaries to the following positions: assistant director, Hygienic Laboratory, $2,640 to $3,240; senior bacteriologist, $1,800 to $2,400; senior serologist, $1,800 to $2,400. Residence in West Virginia has been waived in the consideration of applicants for these positions.

THE fiftieth anniversary meeting of the Society for the Promotion of Engineering Education will be held in Chicago on June 18, 19 and 20.

THE New England regional meeting of the American Society for Metals will be held at the Hotel Taft in New Haven on May 22. The meeting will consist of a morning, afternoon and evening session. Information and developments important to war production will be emphasized in the program.

THE role of the scientific man in the war effort and how he can be more fully utilized will be discussed at the forthcoming National Wartime Conference which takes place on May 8 and 9 at the Hotel Commodore, New York City. Dr. Kirtley F. Mather is chairman of the conference, which has arranged for panel and round-table discussions on how essential the scientific worker is to the winning of the war and will ask that greater attention be given to his proper utilization. Among those who will speak are Dr. Otis Caldwell, American Association for the Advancement of Science; Senator Harley M. Kilgore, of the Committee on Military Affairs; Dr. Theodore Rosebury, chairman, New York Branch of the American Association of Scientific Workers; Dr. Albert B. Newman, dean of the Engineering School, College of the City of New York; Dr. John P. Peters, professor of internal medicine, Yale University School of Medicine; Dr. Ernst Boas, president, New York Heart Society, and Dr. Carl E. Rice, senior surgeon, U. S. Public Health Service. The American Association of Scientific Workers, the American Association of Engineers, the American Medical Women's Association, the Medical Administration Service, the Allied Dental Council and the First District Dental Society will participate in the conference.

IMMEDIATELY following the annual meeting of the Association of American Medical Colleges at Cleveland, Western Reserve University will celebrate on October 27 the one hundredth anniversary of the School of Medicine. The program is as follows: In the morning there will be an address entitled "Blood Plasma Proteins, Their Production, Function, Substitution and Replacement" by Dr. George H. Whipple, professor of pathology and dean of the School of Medicine and Dentistry of the University of Rochester. This will be followed by a buffet luncheon for delegates and guests. Dr. Alan Gregg, director for the medical sciences, Rockefeller Foundation, will make an address at the University Convocation in the afternoon on "The Matrix of Medicine." Dr. Reginald Fitz, lecturer on the history of medicine at Harvard University Medical School, will give the dinner address entitled "The Crimson Thread" in the evening.

A TERCENTENARY Commemoration of the Invention of the Barometer will be held at the University of Toronto on October 19. Dr. Louis C. Karpinski, of the University of Michigan, will speak on the "Telescope, Microscope and Barometer as a Point of Departure for the Natural Sciences," and G. S. Brett, of the University of Toronto, will discuss "The Effects of the Discovery of the Barometer on Contemporary Thought." In the evening W. E. Knowles Middleton, of the Meteorological Office, Toronto, will speak on "The Subsequent History of the Barometer." "The Applications of the Barometer in Physics and Chemistry" will be the subject of a paper by Dr. John Satterly, of the University of Toronto.

THE establishment of a new program of instruction in agricultural science in the Sheffield Scientific School of Yale University to provide fundamental training for men planning to enter any of the professional fields related to agriculture or the practice of agriculture itself has been announced. According to a statement made by President Seymour, "The program will mark a new departure in agricultural education. Instead of combining practical with theoretical studies

it will resemble pre-medical training in being limited chiefly to the basic sciences. It will be one of several elective programs in biology and will be parallel to the present courses of study in botany and zoology. It is expected to start at the beginning of the new term on July 1." Work will be offered in the sciences fundamental to agriculture, such as botany, zoology, chemistry, genetics, bacteriology and entomology; it will not attempt to duplicate the training in practical agriculture given in agricultural colleges. Where such training is necessary students will obtain it from other institutions after graduation. The first year of the program will parallel that of most university freshmen, with emphasis on mathematics and science. During the next three years, courses will be given in the basic sciences, especially those most closely related to agriculture. Specialists from the Connecticut Agricultural Experiment Station and the Schools of Forestry and Medicine will be called upon to teach special subjects. The administration of the program will be under the direction of Dean Charles H. Warren, of the Sheffield Scientific School.

# DISCUSSION

## NATIONAL LEARNED SOCIETY GROUPS AND THE PUBLIC INTEREST

No American scientist can to-day view the world as it is without knowing that an economic, political, educational and moral crisis threatens our very national existence. Probably no group of citizens not in the armed forces has responded more completely than the scientists whether employed in teaching or in scientific state and national bureaus or in private enterprise. Yet the scientists are under widespread attack because large numbers of scientists in government and college employ have sold their services, "on the side," to private interests. Some concerted effort must be made to restore scientific progress to its proper place of primary service to the public interest.

The fact that scientifically America was relatively unprepared is not disputed. Despite the fact that for some years the imminence of a crisis was obvious, yet in stocks of essential metals, rubber and rubber substitutes American scientists and the Army and the Navy made absolutely inadequate preparations.

The "cartel agreements" in aluminum, in rubber substitutes, in minerals vital to all progress in quantity production dependent, for example, on rapid tooling were made with the assistance of many scientists supposedly employed in public service. Our long delay and the deaths of many thousands of our soldiers must still be laid at the door of those who prevented the American housewife from enjoying her right to the aluminum, the electric power and the gas, and the other great achievements of modern science before the war crisis. The monopolistic practises prevented greater production facilities from being developed.

To conduct the war to which Germany and Italy devoted all their resources for so many years has required of England as it requires of America the intense devotion of every resource in England and America that liberty may not perish in the universe.

To secure the participation of the small industries has been and continues to be one of the vital bottlenecks in production. No less a personage than Secretary Ickes has openly charged the National Academy of Sciences with dereliction in its service of the public interests. Private contracts with great corporations made by professors in colleges and by scientists actively on governmental payrolls have prevented the government, *i.e.*, the Army and the Navy from receiving that advice so essential to democratic processes even in quantity production required by the war effort. When Secretary Ickes requested aid from the National Academy of Sciences and even from government agencies such as the Geological Survey, men were given him whose primary interest was in serving the great corporations which these men represented "on the side." These charges were made by Secretary Ickes in open Congressional hearings held for the purpose of aiding the smaller industries.

In view of the fact that public records, notably government publications concerning the activities of the notorious National Electric Light Association wherein hundreds of college teachers including leading men in our foremost technical schools and universities were reevaled to be on the payroll of the association, make it seem imperative that some organized group take up actively the defense of the scientific group as a whole and to make possible that the public interests be served properly by men with only that end in mind.

Towards this end I introduced the following resolution on January 30, 1943, at the New York meeting of the American Council of Learned Societies to which I was an accredited delegate of the History of Science Society.

The American Council of Learned Societies regards with disapproval the extensive inroads made into university and college staffs of America by great corporations and public utilities; these have been revealed somewhat accidentally, and most unfortunately even in connection with criminal actions or other actions affecting the public interest.

In all matters of the public interest, the American Council of Learned Societies affirms its belief that in a democ-

racy the professors in universities and colleges should serve only the public interest.

We recommend to the university and college administrative officers that all teachers in institutions of higher learning be required to note to their college officials their contractual connections with corporations or private or even public utilities. These connections should be noted after the teachers' names in some readily accessible publication for each institution, so that any pronouncements may be judged by the public and the press as to whether such pronouncements emanate from a financial interest or from an academic (unpaid) interest in the public welfare.

Coupled with this resolution it is expected that an act will be introduced into Congress to compel all so-called expert witnesses who testify before Congressional committees to record their affiliations in advance of their testimony and that such connection be properly indicated when the expert testifies.

By such processes Americans may hope that the scientists will re-establish themselves in the confidence of the public which they serve.

I invite correspondence from all members of scientific societies who feel that the movement is worthy of academic and scientific support.

LOUIS C. KARPINSKI,
*President, History of Science Society*
UNIVERSITY OF MICHIGAN

## ABNORMAL NITROGEN METABOLISM IN BURNS

CERTAIN patients suffering from severe burns have shown gross abnormalities in nitrogen metabolism. The observations suggest that the nutritional status of patients with burns needs careful attention.

Eleven of twenty-two severely burned patients excreted excessive amounts of nitrogen in the urine. Sometimes as much as 45 grams were excreted within 24 hours, or an amount equivalent to the catabolism of 250 grams of protein a day. Such losses cause a serious nitrogen deficit.

Large increases in the residual nitrogen of the urine, both in the absolute amount and in the percentage of the total nitrogen excreted, occurred in some of the patients. Sometimes 80 per cent. of the nitrogen excreted was in this form.

Plasma studies showed a similar abnormality in the nitrogen partition. There was present an azotemia with an increase of urea, but the residual nitrogen of the blood plasma was also markedly increased.

At present it is not possible to state whether the residual nitrogen present in the blood and urine is polypeptide nitrogen, as suggested by other observers.[1, 2] However, it does yield by hydrolysis large amounts of amido and amino nitrogen. The findings are consistent with the presence in both blood and urine of a protein metabolite of high molecular weight.

F. H. L. TAYLOR
STANLEY M. LEVENSON
CHARLES S. DAVIDSON
MARGARET A. ADAMS
HARRIET MACDONALD

THORNDIKE MEMORIAL LABORATORY, 2ND AND 4TH MEDICAL SERVICES (HARVARD) AND THE BURNS COMMITTEE, BOSTON CITY HOSPITAL, AND DEPARTMENT OF MEDICINE, HARVARD MEDICAL SCHOOL, BOSTON, MASS.

The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and Harvard University.

[1] P. Duval, J.-Ch. Roux and Goiffon, *Presse Med.*, 42: 1785, 1934.

[2] O. Lambret, J. Driessens and H. Malatroy, *Compte Rend. Soc. de Biol.*, 123: 12, 1936.

## TYPES OF ARGENTINIAN PLANTS OF SPEGAZZINI

ALL taxonomists working intensively on the flora of South America must necessarily evaluate the many hundreds of species of all groups of vascular plants of Argentina described by the late Carlos Spegazzini (1858–1926). As further exploration of Argentina and adjacent countries brings to light additional species it becomes increasingly important to understand exactly what Spegazzini had as types of his species. This need is now being met through the far-seeing interest of the Department of Botany of the Museo de La Plata of the Universidad de La Plata. Professor Angel L. Cabrera, in charge of the Section of Phanerogams, is supplying five or six of the leading herbaria of the world a complete series of photographs of these types. The first series of 100 prints with detailed labels has just reached the Gray Herbarium. The glossy prints, 12×17 cm, are beautifully prepared. These and the series soon to follow will be invaluable to all students of South American plants.

M. L. FERNALD
HARVARD UNIVERSITY

## OPTICAL ILLUSIONS FROM TRAIN WINDOWS

IF one is riding forward rapidly in a train traversing prairie country with wide vistas, the landscape one passes seems to be a circle revolving counter-clockwise with the center at the horizon on a radius at right angles from the tangent on which the train seems to be moving.[1] If now the train stops, the movement of the illusory circle seems to reverse and move majesti-

[1] The circular motion described is observed from the right side of the train, and of course is reversed from the left.

cally in a clockwise direction. This illusion seems more frequently observable when one is tired.

One might explain the illusion by the persistence of small lateral eye muscle movements adjusting the eyeball to the forward movement of the train, so that when the train stops, and the rhythmic eye muscle motion persists, the landscape appears to move in the opposite direction to that which was the case when the train was in motion.

On the other hand, perceptive factors may be involved. If one goes to the rear of the train and watches the landscape continually recede as the train progresses forward, there will be a similar illusory reversal when the train stops. That is, the landscape instead of continually receding will now appear to be rolling toward the stationary observer. This illusion may be due to rhythmic persistence of the activity of muscles of accommodation.

It may be that these factors are important in the etiology of motion sickness.[2] In the case of the vestibular apparatus, there is no rhythmic muscular action involved. However, it is a common experience to continue to feel a ship's motion after one comes ashore. This raises the question as to whether or not the optical illusions noted in connection with a moving train may not involve persistence of the temporarily established receiving pattern, in addition to the possibility of involving persistence of rhythmic and adaptive muscular activity.

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# SCIENTIFIC BOOKS

## SYSTEMATICS

*Systematics and the Origin of Species.* By ERNST MAYR. Columbia University Press. 334 pp. 29 figures. 1942. $4.00.

WITHIN recent years there has been manifest in the writings of taxonomists an altered position which has been called "the new systematics," although the only novelty manifest is in the approach to the subject. The present work is by one of the adherents of this movement, who says in his preface that animal taxonomy has undergone a revolution almost as fundamental as that which occurred in genetics after the rediscovery of Mendel's laws. While one may doubt the accuracy of the statement no one can question that a new view-point dominates the field. Undoubtedly the efforts of the early taxonomists to apply names to organisms that would permanently designate them has given way to the recognition that no two organisms are ever exactly alike and that accordingly any common name is very unlike in its value in different groups. This uncertainty is indeed recognized by the author, for he says: "There is no uniform point of view among taxonomists, in fact in regard to many of these questions there may not even be a majority opinion." In seeking for an explanation of this state of affairs he says that it is not yet clear, but he goes on to point out the need for a full knowledge of the group as a prime necessity for an agreement. He makes it clear that ornithology has reached such a stage of advancement that less than 2 per cent. of the bird species of the world remain unknown, and that therefore bird classification occupies a very favorable position for future developments. Indeed the attitude of the author is one which makes for a much better understanding of the relations of living things. For him not only is taxonomy important, but also genetics, ecology and paleontology contribute toward this end. Taxonomy takes on a larger and larger aspect and brings more and more of these problems into a common biological relationship.

In this book we find a discussion of these problems with many illustrative references, particularly to birds. The author is appreciative of the contribution made by genetics, although he recognizes the peculiar approach which it makes to the subject. The geneticist seeks an understanding of the mechanism of the "biological atoms" in their movements and changes, while the taxonomist deals with groups of organisms in their relation to the environment and to each other. Each side has its own peculiar characteristics of physical and biological factors, and taxonomy is busy selecting between the products of genetic action. The result is that there are nowhere two populations which are identical, if a fine enough analysis is made. This leads directly to the smallest group, the subspecies, and in turn to the species, genus, family, order and class. Since it is with groups that the author primarily deals it is important to find out how he regards them. At once it may be said that he has no conception of a fixed and invariable relation. He regards the species as a dynamic concept, which differs in range and character with the degree of knowledge of the group. He is at pains to point out the growing number of polytypic species as the years pass and more knowledge accumulates. At the same time he realizes the large subjective element in the consideration and the difference in the regard of the systematist and the evolutionist for the same group. For the systematist

[2] Indeed, if a large mirror is before the observer in the situation described in the first paragraph, so that the passing landscape may be seen in reverse motion to that noted from the window, the observer may become uncomfortable or even nauseated by looking alternately through the window and then in the mirror.

the species is a "practical device," a necessary conception for reducing the endless variety of forms to some system; for the student of evolution it is merely a "passing stage in the stream of evolution." He wishes to know how it came into being and whither it leads.

But for both a definition is desired, but it can only be approximate and must be regarded as a convenience of varying value. As yet it is quite impossible to define "species," for the definition depends upon the degree of our knowledge of the group, but he endeavors to reach it by framing definitions of the "practical species concept," the "morphological concept," the "genetic species concept," the "concept based on sterility" and the "biolo-species definition." From all these we emerge with the definition: "Species are groups of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups." Accordingly the test is purely physiological, despite the author's choice of a morphological one. As to the method of origin of a new species it is stated as follows: "A new species develops if a population which has become geographically isolated from its parental species acquires during the period of isolation characters which promote or guarantee reproductive isolation when the external barriers break down." There must therefore exist all degrees of speciation, in which final separation into definite groups is at length attained. A discussion of this question occupies Chapter VII, and non-geographic speciation the following one, with biology of the process forming the substance of the third. We come then to a discussion of the higher categories in evolution, of which the genus is typical. Mayr quotes Thorpe, who defines the genus thus: "A genus is a systematic unit including one species or a group of species of presumably common phylogenetic origin, separated by a decided gap from similar groups." The recognition of this assemblage is regarded as a purely subjective affair, there being no real limits. The book finally ends with a discussion of macro- and micro-evolution factors, where the author reaches the conclusion that "all the available evidence indicates that the origin of the higher categories is a practice which is nothing but an extrapolation of speciation. All the processes and phenomena of macroevolution and the origin of the higher categories can be traced back to intraspecific variation, even though the first steps of such processes are usually very minute."

C. E. McCLUNG

SWARTHMORE COLLEGE

## VOLUMETRIC ANALYSIS

*Volumetric Analysis, Vol. I.* I. M. KOLTHOFF and V. A. STENGER. Second revised edition. xv + 309 pp. 31 figs. 15 × 23 cm. New York: Interscience Publishers, Inc. 1942. $4.50.

THIS book is the first of a two-volume set covering the field of volumetric analysis. In revision, it closely follows the organization of the earlier German edition and its English translation. Volume I deals with theoretical principles, and Volume II, now in preparation, is to consider practical principles.

The book capably deals with the underlying theory of acid-base neutralization, oxidation-reduction, complex-formation and precipitation as related to volumetric analysis. In addition, there are general chapters which discuss titration errors, induced reactions, catalysis, mixed crystal formation and coprecipitation, indicators, organic analysis and physical methods of finding the equivalence point. In the revised edition, a large amount of new material has been added to the discussion of redox indicators; and a section has been added covering the rather new field of amperometric or polarimetric titrations. The chapter on organic volumetric methods has been extensively revised; however, it does little more than exemplify the application of the general theory of volumetric analysis to a few typical problems arising in the organic field. Throughout the book new references have been added, and the appendix has been changed to include new data and to take into consideration the activity principle.

The physical make-up of the book is good. The print is large and easy to read, and the binding is attractive.

The volume is highly recommended to any one interested in volumetric analysis, and should be considered an indispensable part of the library of those engaged in the development or improvement of volumetric methods.

## QUANTITATIVE ANALYSIS

*Analytical Chemistry, Vol. II, Quantitative Analysis.* F. P. TREADWELL and W. T. HALL. Ninth English edition. xi + 806 pp. 121 figs. 15 × 23 cm. New York: John Wiley and Sons. 1942. $6.00.

THIS, the quantitative volume of a two-volume set, describes in detail well-known gravimetric and volumetric methods for the ions and common methods of gas analysis.

In this ninth edition, the scope of the book is unchanged from previous editions. In many cases, newer well-tried methods have replaced older ones, and the older methods have been brought up to date.

There has been a significant change in the make-up and arrangement of the book. The sections on gravimetric, volumetric and gas analysis have been divided into chapters, and the section of tables has been enlarged and brought up to date. The chapters in

the gravimetric section correspond to the ion groups of the ordinary scheme of qualitative analysis. The volumetric section is divided according to type of reaction, such as oxidation-reduction, acid-base neutralization, and others. This new arrangement makes for a much more attractive and useful volume.

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# SPECIAL ARTICLES

## THE ROLE OF "FOLIC ACID" AND BIOTIN IN THE UTILIZATION OF PANTOTHENIC ACID BY THE RAT

THE inclusion, in *highly purified diets* fed to rats, of sulfaguanidine or of succinylsulfathiazole brings about a retardation of growth; after growth ceases the animals lose weight and usually die within a few weeks. The effect of these drugs has been attributed to their interference with the synthesis of essential factors by intestinal bacteria.[1] This explanation is supported by the fact that sulfaguanidine is partially retained in the intestine,[2, 3] while about 95 per cent. of ingested succinylsulfathiazole fails to be absorbed from the alimentary tract.[4, 5] Recently Nielsen and Elvehjem,[6] using succinylsulfathiazole, reported that supplementation with biotin and concentrates of "folic acid" caused a striking resumption in growth which was maintained during several weeks therapy. Martin,[7] who used sulfaguanidine, obtained similar results. We[8] have presented detailed evidence in confirmation of the findings of Nielsen and Elvehjem.

In addition to the cessation of growth, rats fed the sulfonamide in purified diets[9] frequently develop signs of marked pantothenic acid (PA) deficiency, such as achromotrichia and porphyrin-caked whiskers.[8] The fact that "folic acid" (biotin was also present) will cure the achromotrichia produced by sulfaguanidine feeding was attributed by Martin[7] to a chromotrichial action of this factor.

We have found that the signs of PA deficiency in rats are borne out by microbiological assays of the PA content of the liver.[10] Liver obtained from rats on a complete diet[11] or on the highly purified diet without sulfonamide contained 80–90 μgm of PA per gram. Rats fed the purified diet, without either PA or succinylsulfathiazole, developed signs of severe PA deficiency, and the liver tissue contained only 40–50 μgm of PA per gram. Rats fed the purified diet with succinylsulfathiazole (2 per cent.) showed marked evidence of PA deficiency, despite the presence in the diet of adequate amounts of PA (4 mgm per 100 gm), and the PA content of the liver was reduced to only 40–50 μgm per gram. Further increase in the PA content of the diet (10 mgm per 100 gm) caused no favorable effect. Administration of PA subcutaneously, 200 μgm daily, also was without influence on the diminished content of PA in the liver or on the severely depressed rate of growth.

When the purified diet was supplemented with succinylsulfathiazole (2 per cent.) and dried grass[12] (5 per cent.) the PA content of the liver was raised to a value (50–70 μgm per gram) intermediate between normal levels and those produced by the basal diet with added sulfonamide. However, this moderate increase in liver PA content was accompanied by a growth rate comparable to that of rats on the basal diet.

The oral administration of crystalline biotin[13] (5 μgm daily) for a period of 3 weeks caused a slight increase in the PA content of the liver and some improvement in the rate of growth of the succinylsulfathiazole-fed rats. When, however, in addition to biotin (5 μgm), a "folic acid" concentrate[14] (20 mgm

[1] S. Black, J. M. McKibbin and C. A. Elvehjem, *Proc. Soc. Exper. Biol. Med.*, 47: 308, 1941.

[2] E. K. Marshall, Jr., A. C. Bratton, L. B. Edwards and E. Walker, *Bull. Johns Hopkins Hosp.*, 68: 94, 1941.

[3] W. M. Firor and E. J. Poth, *Annals of Surg.*, 114: 663, 1941.

[4] E. J. Poth and F. L. Knotts, *Proc. Soc. Exper. Biol. Med.*, 48: 129, 1941.

[5] A. D. Welch, P. A. Mattis and A. R. Latven, *Jour. Pharmacol. and Exper. Therap.*, 75: 231, 1942.

[6] E. Nielsen and C. A. Elvehjem, *Jour. Biol. Chem.*, 145: 713, 1942.

[7] G. J. Martin, *Proc. Soc. Exper. Biol. Med.*, 51: 353, 1942.

[8] A. D. Welch and L. D. Wright, *Jour. Nutrition*, in press.

[9] Composition of diet: casein (Labco) 18 gm, fat (Primex) 10 gm, corn oil 2 gm, sucrose 61.9 gm, salts 4 gm, cellu flour 4 gm, vitamins A, D and E concentrate 0.08 gm, choline chloride 0.1 gm, thiamine hydrochloride 0.2 mgm, riboflavin 0.4 mgm, pyridoxine hydrochloride 0.2 mgm, nicotinic acid 4 mgm, calcium pantothenate 4.4 mgm, p-aminobenzoic acid 4 mgm, inositol 8 mgm, 2-methyl-1,4-naphthohydroquinone diacetate 1 mg.

[10] Some of the liver samples were prepared for assay after autolysis as described by L. D. Wright, *et al.*, University of Texas Publication, 4137: 38, 1941. We now employ enzyme digestion of the liver samples with taka-diastase, as recommended by V. H. Cheldelin, *et al.*, University of Texas Publication 4237: 15, 1942. With liver samples autolysis liberates approximately 90 per cent. of the pantothenic acid found after enzyme treatment. Pantothenic acid was determined by either the method of D. Pennington, *et al.*, *Jour. Biol. Chem.*, 135: 213, 1940, or the method of M. Landy and D. M. Dicken, *Jour. Lab. and Clin. Med.*, 27: 1086, 1942.

[11] Purina chow.

[12] Powdered grass ("Cerophyl") was generously supplied by Dr. Richard Graham, of the Cerophyl Laboratories, Kansas City, Mo.

[13] We are indebted to Dr. Hans Molitor, Merck Institute for Therapeutic Research, and Dr. W. H. Engels, Research Laboratories, Merck and Company, for a generous gift of crystalline biotin.

[14] Prepared from "Cerophyl" by the procedure described by B. L. Hutchings, N. Bohonos and W. H. Peterson, *Jour. Biol. Chem.*, 141: 521, 1941. This concentrate contained approximately 800,000 Snell-Peterson units of "folic acid" per gram.

daily) was administered orally, not only was the growth rate of the rats restored to a rate comparable to that produced by the basal diet, but also the PA content of the liver was increased to a level entirely within normal limits.

TABLE I

CHANGE IN WEIGHT AND PANTOTHENIC ACID CONTENT OF LIVER OF RATS FED SUCCINYLSULFATHIAZOLE*

| Group | Daily supplement | Number of animals | Change in weight gm | Pantothenic acid content of liver µgm/gm |
|---|---|---|---|---|
| 1 | None ..... | 3 | − 8 | 48 (47–49) |
| 2 | Cryst. biotin 5 µgm. | 3 | +16 | 57 (55–61) |
| 3 | Cryst. biotin 5 µgm + "folic acid" concen. 20 mgm ..... | 3 | +46 | 81 (80–82) |
| – | Pantothenic acid deficient rats (for reference) ..... | 3 | – | 46 (44–49) |
| – | Rats on "Purina" chow (for reference) ..... | 4 | – | 89 (88–91) |

* The groups (1–3) were composed of animals which had received succinylsulfathiazole in the purified diet for a period of 12 weeks. At that time the livers of 3 such animals were found to contain 40 (33–46) µgm of PA per gram. The supplements were administered once daily (except Sundays) by stomach tube during a period of 3 weeks.

These data suggest that for the proper utilization of PA by the tissues of the rat "folic acid," in addition to biotin, must be available. It is probable that the effect of "folic acid" on PA utilization occurs only in the presence of biotin, since a significant growth response in the rat follows the administration of "folic acid" only when biotin is also given.[8] It is unlikely that orally administered PA is inactive because of any interference with its absorption from the alimentary tract caused directly or indirectly by the sulfonamide, since parenterally administered PA is also quite ineffective.

Conceivably, the effect of these substances might be due to counteraction of the effect of the sulfonamide. However, *in vitro* studies of the effect of the "folic acid" concentrate on the bacteriostatic action of sulfathiazole (1:8,000,000) on *E. coli* showed that in a concentration of 1:3500 it had no activity not attributable to p-aminobenzoic acid, or to other heat-acid stable constituents.[15] p-Aminobenzoic acid, it will be noted, was present in the diet to the extent of 4 mgm per 100 gm.

An attractive hypothesis suggests that in the absence of "folic acid" and biotin, PA can not be utilized by the organism. Whether the influence of these trace-factors on PA utilization results from an effect on the synthesis of PA derivatives by intestinal bacteria, from an effect on the synthesis of such derivatives by the tissues of the rat, or from other effects, has not yet been established. Experiments bearing on these points are now in progress.

[15] We are indebted to Dr. Lawrence Peters of this laboratory for the experiments with *E. coli*.

According to the views presented, the basic fault, when hair pigmentation ceases following the use of purified diets containing poorly absorbed sulfonamides, actually may be the improper utilization of PA, so that the end result may be comparable to the exclusion of PA from the diet. Rather than as chromotrichial agents, *per se*, either "folic acid" or biotin might be considered as concerned primarily with PA metabolism. Possibly a similar explanation may be applied to the growth effects of these factors.

The growth stimulation sometimes caused by p-aminobenzoic acid is now believed to result from the stimulation of intestinal microorganisms to produce unknown factors. It has been shown that p-aminobenzoic acid will stimulate the synthesis of "folic acid" by the intestinal bacteria of the chick, *in vitro*.[16] It might be reasoned that the controversial anti-gray hair action and growth effects of the former substance result from a stimulation of the bacterial synthesis in the intestine of "folic acid," and perhaps of biotin. These, in turn, improve the utilization of available PA. Such a hypothesis suggests that any chromotrichial action of p-aminobenzoic acid may be mediated through "folic acid" and biotin, and that the chromotrichial effects of the latter substances are secondary to that of pantothenic acid.[17]

## SUMMARY

The addition of succinylsulfathiazole to *highly purified diets* containing all dietary factors known to be required by the rat, including pantothenic acid, results in the appearance of signs of severe pantothenic acid deficiency, including achromotrichia and porphyrin-caked whiskers. These changes are accompanied by a marked reduction in the pantothenic acid content of the liver, and are corrected by the inclusion in such diets of crystalline biotin and "folic acid" concentrates. The utilization of pantothenic acid by the rat appears to depend on the availability of biotin and "folic acid." Under normal conditions these are supplied by the diet and synthesized by intestinal bacteria.

A hypothesis is offered in explanation of the chromotrichial actions of "folic acid," biotin and p-aminobenzoic acid.

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[16] G. M. Briggs, Jr., J. D. Luckey, R. C. Mills, C. A. Elvehjem and E. B. Hart, *Proc. Soc. Exper. Biol. Med.*, 52: 7, 1943.

[17] This interpretation of certain effects of "folic acid" and biotin obviously does not exclude them from the performance of other roles in living processes.

# SCIENTIFIC APPARATUS AND LABORATORY METHODS

## THE USE OF FIBROUS SODIUM PECTATE AS A SUBSTITUTE FOR AGAR IN BACTERIOLOGICAL GELS

THE war has stopped importation of agar and, because facilities for its manufacture in America are not sufficient to meet the demand, the development of a suitable substitute for use in bacteriology is of extreme importance.

In this laboratory certain mixed metallic salts of fibrous pectic acid have proved satisfactory. The preparation and properties of fibrous sodium pectate have been reported by Baier and Wilson.[1] It should not be confused with the ordinary granular form which is not suitable for the purpose described. Fibrous sodium pectate may be purchased on the market[2] but is more satisfactory if purified by suspending it in 60 per cent. alcohol, adjusting the pH of the suspension to 7.5 with sodium hydroxide, filtering the pectate and drying it *in vacuo* at 60° C.

In preparing a nutrient gel, fibrous pectate to make a 2.5 per cent. solution is added to a nutrient broth which should contain 2 mg of calcium ion per gram of pectate in addition to the amount already present in the broth. A test should be made on the nutrient broth with a calcium salt to be sure that no ions are present which precipitate calcium, since that ion is necessary for the formation of the gel. Complete dispersion of the pectate is obtained by heating the mixture above 80° C. The medium is sterilized in the usual manner.

When preparing counting plates care must be taken to insure complete mixing of the bacterial suspension and pectate medium, which is somewhat more viscous than a similar agar medium. Plates should be allowed to stand at least 30 minutes prior to inversion and incubation. Pour-temperature after one autoclaving is between 45 and 50° C. The medium can be remelted in an autoclave, but each remelting raises the gelling temperature five to ten degrees.

Nutrient gels prepared with sodium calcium pectate show a smaller change of pH on sterilization than do similar agar gels. The water retention ability is slightly better than that of agar. Most organisms tested grow on pectate media without causing liquefaction and the fact that some do cause liquefaction may offer a means of differentiating them. Many tests[3] have been made on the action of microorganisms on pectate media, typical results being illustrated in Table 1.

TABLE 1

ACTION OF MICROORGANISMS ON PECTATE MEDIA

| Microorganism | Growth | Liquefaction |
|---|---|---|
| *Bacillus danicus* | good | none |
| *Escherichia coli* | " | " |
| *Pseudomonas fluorescens* | " | " |
| *Proteus vulgaris* | " | " |
| *Staphylococcus albus* | " | " |
| *Aerobacter aerogenes* | " | " |
| *Salmonella enteriditis* | " | " |
| *Bacillus subtilis* | " | positive |
| *Sporosarcina ureae* | " | " |
| *Vibrio cholerae* | fair | none |
| *Leuconostoc dextranicus* | poor | " |

The results in Table 1 are a representative sample of the 58 organisms tested. The growth of molds has not been tested on pectate media in this laboratory; however, the Fermentation Division, Northern Regional Research Laboratory, Peoria, Illinois, has reported that a number of molds grew well on them. Only three of those examined, *Rhizopus oryzae*, an *Aspergillus niger* and a *Penicillium italicum*, liquefied the pectate.

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[1] W. E. Baier and C. W. Wilson, *Ind. Eng. Chem.*, 33: 287, 1941.

[2] California Fruit Growers Exchange, Ontario, California.

[3] We express our appreciation to Ruth M. Chesbro, R. O'Neal and C. S. York, Department of Bacteriology, University of California, for their bacteriological testing.

## BOOKS RECEIVED

BEAUCHAMP, WILBUR L. and JOHN C. MAYFIELD. *Basic Electricity.* Illustrated. Pp. viii + 312. Scott, Foresman and Co. $1.60.

GEORGE, RUSSELL D. *Minerals and Rocks.* Illustrated. Pp. xviii + 595. Appleton-Century. $6.00.

HART, ALAN L. *These Mysterious Rays.* Illustrated. Pp. x + 218. Harper and Brothers. $2.75.

HEISIG, G. B. *The Theory and Practice of Semimicro Qualitative Analysis.* Pp. xiii + 331. W. B. Saunders Co. $2.50.

JAMES, GLENN and ROBERT C. JAMES. *Mathematics Dictionary.* Illustrated. Pp. viii + 319. The Digest Press. $3.00.

KELLY, FRED C. *The Wright Brothers.* Illustrated. Pp. 340. Harcourt, Brace and Company. $3.50.

MCFARLAN, ARTHUR C. *Geology of Kentucky.* Illustrated. Pp. xxviii + 531. The University of Kentucky.

MIGONE, RAUL C. *Inter-American Statistical Yearbook 1942.* Illustrated. Pp. 1066. Macmillan. $10.00.

MILLAR, C. E. and L. M. TURK. *Fundamentals of Soil Science.* Illustrated. Pp. xi + 462. John Wiley. $3.75.

WILSON, CHARLES MORROW. *Trees and Test Tubes.* The Story of Rubber. Illustrated. Pp. xii + 352. Henry Holt and Co. $3.50.

WULFF, E. V. *An Introduction to Historical Plant Geography.* Illustrated. Pp. xi + 223. Chronica Botanica Co. $4.75.